ME 338 Syllabus - Fall 2014

Lecture:
MWF 1:00 pm – 2:00 pm, ETC 2.108

Instructor:
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Text:
Norton, Robert, Machine Design: An Integrated Approach, 5th Edition

Course Summery and Objectives:
Undergraduate level course on modeling, design, integration and best practices for use of machine elements such as bearings, springs, gears, cams and mechanisms. Modeling and analysis of these elements is based upon extensive application of physics, mathematics and core mechanical engineering principles (solid mechanics, fluid mechanics, manufacturing, estimation, computer simulation, etc...). These principles are reinforced via a substantial design project wherein students model, design, fabricate and characterize a mechanical system that is relevant to a real world application. Students master the materials via problem sets/quizzes that are directly related to, and coordinated with, the deliverables of their project. Student assessment is based upon mastery of the course materials and the student's ability to synthesize, model and fabricate a mechanical device subject to engineering constraints (e.g. cost and time/schedule).

Prerequisites:
ME 311 and EM 319

Grading:
- Exams: 45% (15% each)
- In class exercises and quizzes: 10%
- Project: 30%
- Homework: 15%

Examinations:

There will be three open-book, open-note examinations throughout the semester. These exams will be semi-cumulative as prior course information is necessary but will not be directly tested.

Homework:

All homework must be submitted in class on the due date. Students may collaborate on homework assignments but must clearly indicate who they worked with at the top of each submitted assignment. However, any evidence of plagiarism or other forms of scholastic dishonesty will not be tolerated.

Special Notes:

Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, http://www.utexas.edu/diversity/ddce/ssd/

Class Project:

This class will focus on (i) understanding the role of concepts, principles, design process, best practices, mathematics, physics and engineering modeling within mechanical design; and (ii) rigorous application of concepts, principles, design process, best practices, mathematics, physics and engineering modeling to realize a complex and high quality mechanical design. You will learn "by doing" and learn by gaining insight/perspective via interaction with the staff. This year in ME 338, teams of about 6-8 students will model, design, build and characterize the performance of a remote control car. Each team will design a 'group' RC car and must build at least one car. The construction and analysis of a device that meets functional requirements is a critical element of receiving a good grade in this class. The final performance evaluation of the RC cars will be performed during the final exam time slot.

Design notebook

Each student must keep a design notebook and each group must keep a design notebook. These must be dedicated notebook in which all of your ideas, calculations, and records are stored. It is expected that you will paste copied pages from individual notebooks into the group notebook. You must bring your notebooks to all class events. They will be collected at the end of the semester and graded, so please make sure they are legible and organized. Loose papers must be stapled or glued in; no loose papers will be included in the grading. We encourage you to paste in pictures of the parts when appropriate.

Final report

A final report of at most 6 pages (not including appendices) is required and will be due at the time of the final exam. The purpose of the report is for you to convince the staff that you learned and used the course material properly. The contents of the report are up to the group; however it would be reasonable to include descriptions of your group's activities, calculations, predictions, results, lessons learned and performance data. All reports are 12 point font, double-spaced and 1 inch margins.

Course Schedule:

Date	Topic	Reading	Homework	Project Milestones
8/27	Intro			
8/30	Materials	Ch.2		
9/1	No Class – Labor Day			
9/3	Load Analysis	Ch. 3.0-3.7		
9/5	Beam Loading	Ch. 3.8-3.10		
9/8	Principal Stresses	Ch. 4.0-4.9		
9/10	Beam Deflections	Ch. 4.10-4.11		
9/12	Beam Deflections Continued		Homework #1 Due	
9/15	Torsion and Columns	Ch. 4.12-4.16		Project Teams Formed
9/17	Ductile Failure	Ch. 5.0-5.1		
9/19	Brittle Failure	Ch. 5.2-5.6		
9/22	Fatigue Failure	Ch. 6.0-6.8		
9/24	Designing for Fatigue	Ch. 6.10-6.15		
9/26	Wear	Ch. 7.0-7.4	Homework #2 Due	
9/29	Exam Review			
10/1	Exam #1			
10/3	Wear Continued	Ch. 7.5-7.9		
10/6	Shaft Loading	Ch. 10.0-10.9		
10/8	Shaft Keyways and Couplings	Ch. 10.10-10.17		
10/10	Sliding Bearings	Ch. 11.0-11.7	Homework #3 Due	
10/13	Rolling Bearings	Ch. 11.8-11.14		
10/15	Linkages			
10/17	Gear Kinematics	Ch. 12.0-12.5		Chassis and Axel Design Due
10/20	Gear Elastomechanics	Ch. 12.6-12.13		
10/22	Gears continued	Ch. 13.1-13.3		
10/24	Belts	Handout	Homework #4 Due	
10/27	Exam Review			
10/29	Exam #2			
10/31	Power Screws	Ch. 15.0-15.3		
11/3	Bolted Joints	Ch. 15.4-15.12		
11/5	Bolted Joints Continued			
11/7	Welded Joints	Ch. 16.0-16.5	Homework #5 Due	Drive Design Due
11/10	Compression Springs	Ch. 14.0-14.6		
11/12	No Class – Work on Projects			
11/14	Extension, Torsion and Bellville Springs	Ch. 14.7-14.9		
11/17	Clutches	Ch. 17.0-17.4		

11/19	Breaks	Ch. 17.5-17.7		
11/21	Exam Review		Homework #6 Due	Steering Design Due
11/24	Exam #3			
11/26	Micro/nanoscale Machine Elements			
11/28	No Class - Thanksgiving			
12/1	Project Presentations			Full CAD Assembly Due
12/3	Project Presentations			
12/5	Project Presentations			Race